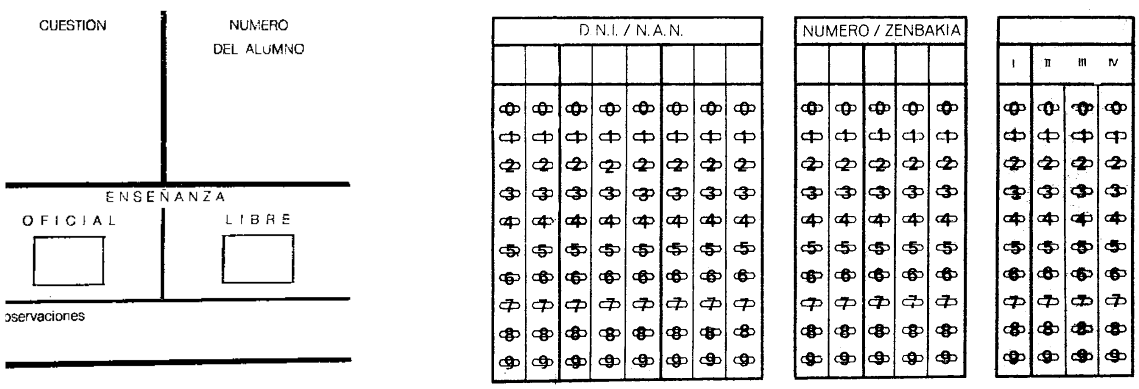
BUSINESS STATISTICS - Second Year | Academic Year 2009-10
Voluntary Quiz 2 | December 4, 2009

INSTRUCTIONS

1. The quiz contains multiple choice questions that must be answered in the orange code sheet we have provided you with.
2. To select an answer, all you need to do is mark in the orange code sheet, **filling the rectangle over which the selected answer is located appropriately**. Please make sure you know the answer you wish to mark before doing it. Even though you can always erase your mark if you have used a pencil (number 2 or similar), any mark that has not been completely erased could be read by the machine. Therefore, we advice you to first mark your selected answers in the exam and to use only the last ten minutes or so from the time assigned to the multiple choice questions part of the exam to copy them into the code sheet.
3. In the multiple choice questions part of the exam there is always **only one correct answer** for every question. Every question correctly answered is worth 1 point, while each question incorrectly answered will not penalize your grade at all. Questions that have not been answered do not penalize your grade in any form.
4. The quiz has four numbered sheets, going from 0.1 to 0.3. Please make sure that you have all sheets and contact your professor if this is not the case. There are different exam types. This exam is of type 0. Mark a 0 in the column labelled with I in your code sheet, just as it is illustrated in the example.
5. The maximum final grade is 15 points. **You will need to obtain 11 points to pass this quiz**.
7. Please fill in your personal information in the appropriate places in the code sheet.

Example:

$\underbrace{12545}$ PEREZ, Ernesto Exam type $\underbrace{0}$ Resit



MULTIPLE CHOICE QUESTIONS (Time: 50 minutes)

1. FREE-QUESTION. The capital of Spain is:

   (A) Paris (B) Sebastopol (C) Madrid (D) London (E) Pekin

2. Let X_1, X_2 and X_3 be independent random variables such that $X_1 \in \gamma(1,2)$, $X_2 \in \gamma(2,1)$ and $X_3 \in \gamma(1/2,3)$. If we define the random variable $Y = 2X_1 + 4X_2 + X_3$, then the distribution of the random variable Y is:

   (A) $\gamma(0.5,5)$ (B) $\chi^2_{\overline{6}|}$ (C) $\gamma(0.25,6)$ (D) All false (E) $\gamma(2,4)$

3. Let X be a random variable having a $\gamma(1/2,10)$ distribution. Then, $P(-1 < X < 23.8)$ is:

   (A) 0.75 (B) 0.25 (C) 0.90 (D) 0.10 (E) It cannot be determined

4. Let X be a random variable having an exponential distribution with mean $\frac{1}{4}$. Then, $P(X \geq \frac{1}{4})$ is, approximately:

   (A) 0.94 (B) 0.63 (C) 0.37 (D) 0.02 (E) 0.98

5. The lifetime of an mp4 device, in **thousands of hours**, follows an exponential distribution with mean 3. The manufacturer replaces the mp4 device if it fails before its warranty period of **600 hours** expires. What is the approximate probability that the manufacturer replaces an mp4 device?

   (A) 0.30 (B) 0.70 (C) 0.82 (D) 0.45 (E) 0.18

6. Let X be a random variable having a Snedecor's $\mathcal{F}$ distribution $\mathcal{F}_{\overline{n_1,n_2}|}$. Then, we always have that:

   (A) $\mathcal{F}_{\overline{n_1,n_2}|\alpha} > \mathcal{F}_{\overline{n_1,n_2}|\frac{\alpha}{2}}$ (B) $\mathcal{F}_{\overline{n_1,n_2}|\alpha} = \mathcal{F}_{\overline{n_1,n_2}|1-\alpha}$ (C) $\mathcal{F}_{\overline{n_1,n_2}|\alpha} = \mathcal{F}_{\overline{n_1,n_2}|1-\frac{\alpha}{2}}$

   (D) $\mathcal{F}_{\overline{n_1,n_2}|\frac{\alpha}{2}} > \mathcal{F}_{\overline{n_1,n_2}|\frac{\alpha}{4}}$ (E) $\mathcal{F}_{\overline{n_1,n_2}|\alpha} < \mathcal{F}_{\overline{n_1,n_2}|\frac{\alpha}{2}}$

7. Let X be a random variable having a $t_{\overline{15}|}$ distribution. Then, $P(-0.258 < X < 2.60)$ is:

   (A) 0.59 (B) 0.80 (C) 0.41 (D) 0.98 (E) 0.20

8. Let X be a random variable having an $\mathcal{F}_{\overline{6,7}|}$ distribution. Then, $P(X < 0.2375)$ is:

   (A) 0.95 (B) 0.90 (C) 0.01 (D) 0.10 (E) 0.05

9. Let X be a random variable with probability mass function given by

$$P(X=0) = \theta^3; \quad P(X=1) = \theta^2(1-\theta); \quad P(X=2) = (1-\theta)^2; \quad P(X=3) = 2\theta(1-\theta).$$

   In order to estimate the parameter θ, a random sample of size $n = 150$ has been taken, providing the following results: a zero was obtained in 24 occasions, a one was obtained in 54 occasions and a two was obtained in 32 occasions. The maximum likelihood estimate of the parameter θ is:

   (A) 0.24 (B) 0.76 (C) 0.42 (D) 0. (E) 0.58

Questions 10 and 11 refer to the following exercise:

Let X be a random variable having a uniform $U[\theta, 10]$ distribution. In order to estimate the parameter θ, a random sample of size n, $X_1, \ldots, X_n$, has been taken.

10. The method of moments estimator of θ is:

(A) $\overline{X} - 10$ (B) $2\overline{X} - 10$ (C) $\overline{X}$ (D) $2\overline{X} + 10$ (E) $\overline{X} + 10$

11. Is this an unbiased estimator of θ?

(A) No (B) - (C) Yes (D) - (E) -

Questions 12 to 14 refer to the following exercise:

Let X be a random variable with probability density function given by

$$f(x, \theta) = \begin{cases} \dfrac{3\theta^3}{x^4} & \text{for } x \geq \theta, \ \ \theta > 0 \\ 0 & \text{otherwise} \end{cases}$$

and it is known that the mean of X is $m = \frac{3\theta}{2}$.

In order to estimate the parameter θ, a random sample of size n, $X_1, \ldots, X_n$, has been taken.

12. The method of moments estimator of θ, $\hat{\theta}_{MM}$, is:

(A) $\dfrac{\overline{X}}{2}$ (B) $\dfrac{2}{3\overline{X}}$ (C) $\dfrac{\overline{X}}{3}$ (D) $\dfrac{2\overline{X}}{3}$ (E) $3\overline{X}$

13. Is the estimator $\hat{\theta}_{MM}$ an unbiased estimator of θ?

(A) - (B) - (C) Yes (D) - (E) No

14. The maximum likelihood of θ, $\hat{\theta}_{ML}$, is:

(A) $\max(X_i)$ (B) $2\overline{X}$ (C) $\dfrac{\overline{X}}{3}$ (D) $\min(X_i)$ (E) $3\overline{X}$

15. We have a random sample of size n from a Poisson with parameter λ. As an estimator of λ, we have decided to use $\hat{\lambda} = \overline{X} + \dfrac{2}{n^4}$. Is this a consistent estimator of λ?

(A) No (B) - (C) Yes (D) - (E) -